SECTION 2

- PANDEMIC INFLUENZA DISEASE SURVEILLANCE -

1. INTERPANDEMIC AND PANDEMIC ALERT PERIODS

A. State and local responsibilities:

- Continue state influenza surveillance efforts to oversee improvements in influenza surveillance (e.g., virologic, outpatient, hospitalization, and mortality surveillance).
- Conduct influenza surveillance year round, where possible.
- Implement enhanced surveillance for detection of the first U.S. cases of novel virus infection.

B. State and large local public health laboratory responsibilities:

- Isolate and subtype influenza viruses year round.
- Improve capacity for rapid identification of unusual influenza strains.

2. PANDEMIC PERIOD

Should an influenza pandemic begin in the United States or another country:

A. State and local responsibilities:

- Implement enhanced surveillance for detection of the first cases.
- Enhance all influenza surveillance components (virologic, outpatient, hospitalization, and mortality).
- Communicate to all partners the heightened need for timely and complete surveillance data.

3. RATIONALE

Pandemic influenza surveillance includes surveillance for influenza viruses (virologic surveillance) and surveillance for influenza-associated illness and deaths (disease surveillance).

A. The goals of virologic surveillance are to:

- Rapidly detect the introduction and early cases of a pandemic influenza virus in the United States.
- Track the virus' introduction into local areas.
- Monitor changes in the pandemic virus, including development of antiviral resistance.

B. The goals of disease surveillance are to:

- Serve as an early warning system to detect increases in influenza-like illness (ILI) in the community.
- Monitor the pandemic's impact on health (e.g., by tracking outpatient visits, hospitalizations, and deaths).
- Track trends in influenza disease activity and identify populations that are severely affected.

Virologic and disease surveillance data—supplemented by data from outbreak investigations and special studies—can help decision-makers identify effective control strategies and re-evaluate recommended priority groups for vaccination and antiviral therapy. They can also facilitate efforts to mathematically model disease spread during a pandemic. The national influenza surveillance system, which monitors seasonal influenza, will provide the virologic and disease surveillance data needed to guide response efforts during a pandemic (www.cdc.gov/flu/weekly/fluactivity.htm; Table 1). When a pandemic begins, some enhancements might be instituted to improve geographic and demographic coverage and increase the amount of detail captured by particular components of the national influenza surveillance system.

4. INTERPANDEMIC ALERT PERIOD

The public health goals of influenza disease surveillance are to serve as an early warning system and to detect increases in ILI at the local level, to monitor the impact of influenza on health (e.g., by tracking outpatient visits, hospitalizations, and deaths), and to track trends in influenza disease activity and identify populations that are severely affected. During the Interpandemic Period, these goals are accomplished through the components of the national influenza surveillance system (Table 1). Currently, the Massachusetts Department of Public Health participates in four of the five components of the national surveillance system-whose participants include healthcare providers, vital statistics office, local and state health departments and public health laboratories. These components include virologic surveillance, outpatient influenza-like illness (ILI) surveillance, hospital surveillance, mortality surveillance and state-level influenza activity assessment.

A. Virologic Surveillance

In order to identify and characterize circulating strains of the influenza viruses, which in turn will help inform annual vaccine formulation and to characterize strains with pandemic potential at the national level, the MDPH Virus Isolation Laboratory is part of the National Respiratory and Enteric Virus Surveillance System (NREVSS) and conducts year round testing for influenza, reports information on isolates to CDC on a weekly basis, and submits isolates to the CDC for typing. More detailed information about laboratory surveillance can be found in the laboratory section. In addition, six hospitals in Massachusetts routinely isolate influenza virus and send isolates to the SLI for sub-typing, including:

- Massachusetts General Hospital, Boston
- Beth Israel Deaconess Medical Center, Boston
- Brigham and Women's Hospital, Boston
- Children's Hospital, Boston
- New England Medical Center, Boston
- Lahey Clinic, Burlington

Guidelines for human avian influenza cases, including specimen collection and testing protocols, were developed with consultation from the State Laboratory Institute (SLI) and the Centers for Disease Control and Prevention (CDC). Additionally, internal procedures have been developed for laboratory and epidemiology staff use when dealing with suspect cases of human avian influenza and an MDPH-developed intake screening form was developed for obtaining pertinent case information. Lastly, clear and quick communication protocols between epidemiologists and SLI lab personnel have been established regarding suspect cases.

The current capacity of the SLI to test for avian influenza is approximately 300 specimens per day. MDPH laboratory personnel, surveillance and information technology staff and epidemiologists meet on a monthly basis to addresses logistics of enhancing surveillance for influenza, including dealing with surge capacity, prioritization of samples, reporting of results, data collection and dissemination, and efficient and timely internal and external communication.

Currently, specimens that may show some antiviral resistance, or are unusual, are forwarded to CDC for further characterization.

B. Outpatient and Hospital Disease Surveillance

a. Sentinel Provider Network

Surveillance for outpatient visits for ILI is conducted via the Sentinel Provider Network (SPN), a collaborative effort among states, including the MDPH, healthcare providers, and CDC. A team of epidemiologists in the Division of Epidemiology and Immunization recruit and maintain the local network of healthcare providers who report weekly the total number of patient visits and number of patients with ILI. SPN members also send specimens from a subset of patients with ILI to SLI for diagnostic testing at no cost. Recruitment for new sites, particularly from parts of the state or risk groups that are under-represented is a continued focus, striving for a balanced representation of sites that are diverse in age, risk groups, geography and patient populations who travel.

The MDPH influenza sentinel provider program has 39 sites, or 1/166,000 population, that regularly report their weekly data to CDC via the internet during the influenza season; this exceeds the recommended 1 site per 250,000 population by CDC. Continued participation by a select number of sites in the "off-season" (May through September) began in 2000, and as of 2004 all sites were asked to report their data to CDC year round. Additional efforts related to the SPN include:

- Recruitment for new sites, particularly from parts of the state or risk groups that are under-represented, continues for the 2005-06 year. Site enrollment strives for a balanced representation of sites that are diverse in age, risk groups, geography and patient populations who travel internationally (particularly Asia).
- The MDPH influenza team monitors the weekly reporting of data to the CDC and follows up with sites experiencing difficulty reporting.
- The influenza team provides ongoing feedback to health care providers in the form of weekly email reports, which contain up-to-date information on ILI and influenza in Massachusetts and their region. Additionally, each site receives at least one visit per season from a member of the influenza team.
- MDPH requests that specific travel history and significant poultry exposure is included on any specimen submission from patients according to the CDC SARS/Influenza A (H5N1) screening form.

b. Reporting

Beginning in 2003, the Massachusetts Isolation and Quarantine Requirements (105 CMR 300.00) require that all providers and laboratories report to the Massachusetts Department of Public Health (MDPH) positive rapid influenza diagnostic test results and positive culture and PCR results. Providers are required to immediately report the following by telephone to the local board of health and MDPH:

- Suspect avian flu cases
- All deaths related to influenza, in children < 18 years of age and pregnant women
- Unusually severe cases of influenza
- Any confirmed or suspect cases of influenza with encephalopathy
- Clusters of influenza-like illness in children, pregnant women or adults
- All clusters of influenza-like illness in long term care facilities or other high-risk institutional settings

Additionally, providers are requested to report:

- Cases of antiviral treatment failure, begun within 48 hours of symptom onset
- Cases of antiviral prophylaxis failure, begun within 48 hours of exposure

An epidemiologist is available 24/7 to report and respond to these cases/situations. If notified of suspect case of avian influenza, it will be reported to CDC using CDC Human Influenza A (H5) Domestic Case Screening Form. Reminders to report, as well as advisories regarding novel strain surveillance, are periodically sent out health care providers, hospitals, laboratories and local boards of health.

Hospitals, Boards of Health, and Neighborhood Health Centers in the Commonwealth have been enrolled into the **Health & Homeland Alert Network (HHAN).** Disseminating information via telephone, email, and website, the HHAN system can deliver information to all of our public health partners in less than two hours.

The current HHAN license structure provides complete coverage for unlimited communications to hospitals, boards of health, community health centers, fire services, EMS, and emergency management via email, text-messaging, and telephone. Redistributing licenses will ensure 100% accessibility for all public health and other partners to the secure FTP features of the current HHAN. However, the HHAN will transition from Global Secure Corporation's Response Manager product to an open source application being developed by the MDPH and will provide equal or superior functionality, saving time in comparison to broadcast faxing.

Currently, MDPH is rolling out its **Electronic Laboratory Reporting (ELR)** project with approximately 20 hospital laboratories in various stages of the implementation process. MDPH has created a portal for laboratories to map their local codes to the national LOINC and SNOMED coding schemas and thereby directly and securely send HL7 messages to MDPH's web-based disease surveillance system. It is estimated that it takes approximately 3-4 months to complete the implementation and approval process to eliminate paper-based systems. MDPH's plan is to bring on the major commercial laboratories and remaining hospital laboratories in the state during the next 18 months.

c. Syndromic Surveillance

Outpatient surveillance, as described above, continues in Massachusetts on a year round basis. In the event of a pandemic when MDPH needs to rapidly expand the number of sentinel sites, sentinel sites that are no longer participating have been contacted and placed on a reserve list of sites should surveillance activities. Rapid communication with sentinel sites is important during a pandemic and the current system, whereby each sentinel site receives a weekly email with up-to-date information on influenza, could be used to deliver timely information in the pandemic era.

Because healthcare providers might not be able to report ILI in a timely manner when overwhelmed with patients during an emergency, MDPH is currently working with partners to evaluate and improve three syndromic surveillance systems that will supplement the traditional sentinel site ILI data. Current datasets being received by the department include:

- **City of Boston Early Aberration Reporting System (EARS) emergency room data**: Existing emergency department "chief complaint" monitoring system is used by 11 hospitals in the city of Boston and the data is reported to and compiled by the Boston Public Health Commission on a daily basis. Such information includes: age, gender,

race/ethnicity, zip code of primary residence, the chief complaint, ICD-9 code when available, and a unique patient identifier (HIPAA-compliant).

- **Harvard Pilgrim Health Care/Vanguard Medical Associates (HPHC/HVMA) syndromic surveillance**: HPHC is a large managed care organization in eastern MA that collects timely data on all of its members via comprehensive electronic medical records. The file contains >465,000members who receive care at 14 HVMA sites, and all individuals' addresses were geo-coded when possible. A system has been developed by which temporal and geographic clusters of cases with diagnoses suggesting respiratory tract illness or influenza-like illness (ILI) can be identified and reported to MDPH via automated alerts the day after the patients' medical encounters. In addition, this system has a website on which raw counts of respiratory and ILI by date and zip code of residence can be monitored by MDPH staff. An epidemiologist promptly investigates significant events.
- **Children's Hospital Boston (CHB)** has developed a system based on emergency department (ED) chief complaints, which are available on-line within minutes of a patient's arrival in the ED. The system will detect surges in patients presenting with respiratory syndromes to EDs, relying on patterns in time (day and season of visit) and in space (home address). In addition to CHB, agreements are currently in place with 8 other hospitals in Massachusetts to assess their data systems for potential inclusion in this syndromic surveillance system.

MDPH is also a partner in the **Center for Excellence in Informatics electronic medical record project** (funded by CDC) and plans to augment the syndromic surveillance ILI data with aggregate ILI data reported by patient zip codes. Additionally, efforts are being made to integrate these systems to identify clusters of acute health events and to improve the efficiency of reporting to MDPH. Studies are underway to determine if these data can be added to SPN data and if they can be reported and analyzed daily.

C. Mortality Surveillance

The collection of mortality data can also help health departments monitor the severity of a pandemic and determine which age groups and areas are most affected.

a. Provider Reporting

Providers are required to immediately report all deaths related to influenza, in children < 18 years of age and pregnant women, by telephone to the local board of health and MDPH. Massachusetts Boards of Health (BOH), which have the authority to issue burial permits under M.G.L. Chapter 111, Section 29 have access to the data from death certificates indicating proximal causes of death and related conditions. Collection and reporting of mortality data is also consistent with the role of local BOHs regarding disease information and deaths attributed to influenza will be made reportable.

b. National Notifiable Disease Surveillance System (NNDSS)

Providers are required to immediately report all deaths related to influenza in children < 18 years of age by telephone to the local board of health and MDPH. These cases are investigated and reported to the CDC using the appropriate case report form.

c. 122 Cities Weekly Mortality Reporting System

Timely data on influenza deaths in other age groups are limited to information provided by the 122 Cities Mortality Reporting System, which provides weekly reports of the total number of death certificates that list P&I as a cause of death and the total number of death certificates filed. In Massachusetts, nine cities and towns (Boston, Cambridge, Fall River, Lowell, Lynn, New Bedford, Somerville, Springfield and Worcester) are included in this system.

d. Mortality Reporting by Local Boards of Health

- **Current state of notification**

  Under normal conditions, city and town clerks are not required to transmit to the DPH Registry of Vital Records and Statistics (RVRS) death certificates until the 10th day of the month following death (c.46 s.17B, M.G.L.). Because Massachusetts does not currently have an automated system of reporting mortality information, these records are received in a paper format and are reviewed manually prior to ICD-10 coding and data entry. A coded file for search of influenza deaths would not be available under normal conditions until at least 3-4 months after death. Therefore, the normal system of death reporting is not adequate under pandemic conditions, and the ENDS system would be deployed.

- **Authority for reporting**

  Massachusetts Boards of Health (BOH), which have the authority to issue burial permits under M.G.L.Chapter 111, Section 29 have access to the data from death certificates indicating proximal causes of death and related conditions. Collection and reporting of mortality data is also consistent with the role of local BOHs regarding disease information and deaths attributed to influenza will be made reportable.

Early Notification of Death System (ENDS)

The following proposal outlines a process for Massachusetts to deploy an **E**arly **N**otification of **D**eath **S**ystem **(ENDS)** for influenza-related mortality collection of mortality data beginning with the "Pandemic Alert" stage of an influenza outbreak through the follow up phases of a pandemic.

ENDS will be deployed under a phased plan, dependent on the stage of pandemic, and will be region-based to allow for efficient management of the system by DPH Bureau of Communicable Disease Control (BCDC). The plan focuses on the primary option of direct reporting to MDPH by local Boards of Health reinforced regionally by larger BOHs that may have more resources and a network of regional MDPH coordinators. Primary target communities and regions will be established as first reporters based on expected number of deaths and population size.

ENDS will intercept mortality information from death certificates by gathering data from local boards of health or burial agents through regional coordinators, who will in turn report to BCDC. MDPH already has five emergency preparedness regions, with two sub-regions, for a total of seven regional offices that are prepared to implement rapid response to urgent public health needs. A reporting system with specific guidelines for cause-of-death identification will be deployed to local boards of health. Each death, prior to burial, cremation, or transport, must cross the desk of the local burial agent for a disposition permit. Although other individuals are involved in the preparation of a death certificate (e.g., physicians and funeral directors), local boards of health (or burial agents) in Massachusetts are subject to MDPH oversight, unchanging in number, and are well qualified to examine death certificates for specific causes of death.

Deployment of ENDS:

In Phase 1, the early pandemic phase, the DPH regional coordinators will target the burial agents of the 25 cities and towns that comprise 40 percent of Massachusetts resident deaths for pandemic influenza mortality surveillance, ensuring that the selections provide adequate geographic representation across the state. Upon notification by the BCDC, the regional coordinators will distribute a FAX form to the designated burial agents with instructions for identifying deaths where influenza was an underlying or contributing cause of death, or mentioned condition. Additionally, alternative methods of transmitting the data are being considered. Transmission may include additional death certificates that mention other respiratory and related conditions potentially associated with influenza. The form, along with photocopies of death certificates will be faxed to BCDC.

Planning meetings are in progress to more fully develop the plan and the logistics. Additionally, MDPH will train reporters and develop appropriate databases to ensure that ENDS can be operated when needed.

D. State-level Assessments

MDPH currently provides weekly assessments of the overall level of influenza activity (i.e., none, sporadic, local, regional, or wide-spread) in the state during influenza season. This assessment is reported to CDC on a weekly basis and is used at the national level to compare the extent of influenza activity from state to state, and is the only state-level influenza surveillance data that CDC makes publicly available during interpandemic influenza seasons. Data that are used to make this weekly assessment include rapid influenza test results reported to MDPH, laboratory results from SLI, clusters of influenza like illness reported to the department, and weekly ILI data reported by sentinel sites. To facilitate and standardize the generation of this activity level in Massachusetts, the laboratory and epidemiologic data described have been merged into one interactive database that can generate reports, graphs and maps as needed throughout the year.

a. Influenza Surveillance Coordinators

MDPH has established an Influenza Surveillance Team that is comprised of the Immunization Program medical director, 3 immunization epidemiologists, the immunization epidemiologist coordinator and the MDPH adult immunization coordinator/pandemic planning coordinator. The MDPH Influenza Surveillance Team meets weekly to plan, revise and continually enhance the MDPH influenza surveillance program. Ongoing duties of the Influenza Surveillance Team include:

a. Continued evaluation and weekly analysis of teleform reports for rapid diagnostic test results

b. Evaluate, improve and update the state influenza website

c. Refine the interactive database that draws influenza data from several sources and has the ability to generate reports, graphs, and maps in a timely fashion

d. Develop and updates advisories for providers and laboratorians, with guidance on identification, diagnosis and reporting of avian influenza in humans.

e. Strongly encouraging current sentinel sites to participate in year-round reporting.

f. Send weekly email newsletter to all sentinel sites with updated information about current influenza epidemiology in Massachusetts, the United States and worldwide, particularly in Asia.

g. Distribute on a weekly basis an electronic copy of a summary of flu activity in Massachusetts to sentinel providers.

h. Investigate and record outbreaks of influenza-like illness (ILI) in institutions, including long term care facilities, as well as in the community.

i. Interface with external providers to facilitate syndromic surveillance

j. Conduct weekly assessments during flu season of overall flu activity in the state for the Activity Level Assessment for the State and Territorial Epidemiologists report and submit that data to CDC each by noon on Tuesday each week.

k. Contribute to state pandemic planning activities.

l. Maintain a strong working relationship with the SLI.

m. Summarize current flu seasons and compare to previous years in annual report.

n. Distribute influenza viral testing kits free of charge to sentinel and non-sentinel sites throughout the year.

o. Encourage sentinel providers to submit specimens for influenza virus identification and sub-typing to the SLI.

p. Monitor sentinel provider data weekly for completeness and errors and follows up on unusual reports.

q. Provide weekly feedback via an electronic newsletter to sentinel providers, encouraging reporting.

r. Conduct site-visits to sentinel sites to provide continued education as well as to facilitate site's weekly ILI reporting.

s. Maintain the following databases:

- Rapid influenza diagnostic test database from data obtained by teleform reporting by providers around the state.
- Database program that includes influenza cultures isolated at either SLI or at other facilities. The database can generate maps and graphs. It is used to compare percentage of ILI increases or decreases in each region week to week at sentinel sites. These data are used for the Activity Level Assessment for the weekly State and Territorial Epidemiologists report.

In addition to the influenza team activities, the Division of Epidemiology and Immunization participates in pandemic preparedness activities, including:

- A workgroup was established in 2000 to address issues related to emergency preparedness within the MDPH Division of Epidemiology and Immunization. Off-hours notification of division staff and assessment of surge capacity available to respond to the emergency as needed will routinely be drilled.
- MDPH routinely participates as an active member in state-wide table top exercises, as planned by the Harvard School of Public Health, and other entities. This allows MDPH to exercise protocols related to surveillance, laboratory testing, surge capacity, communication, and isolation and quarantine.

b. Veterinary Surveillance in Domestic Poultry

The Massachusetts Department of Agricultural Resources (MDAR) and MDPH work in conjunction with United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Services (USDA/APHIS/VS) to conduct surveillance for avian influenza (AI) in poultry in Massachusetts.

There are 6 live bird markets in Massachusetts, 3 in Boston, 2 in the Fall River/New Bedford area and 1 in Springfield, which are tested quarterly by the USDA/APHIS/VS. Tracheal swab samples from 5 birds per farm or lot that are sent to the market or auction are pooled and tested for AI. The USDA takes the lead on live bird market testing and also samples for AI quarterly at the three Massachusetts animal auctions that handle poultry: Swansea, Littleton, and Fairhaven.

Additionally, commercial laying operations that ship "spent" hens to live bird markets in New York and New Jersey are tested 10 days prior to shipment. New York requires 10 serology AI negative samples per flock and New Jersey requires 30 AI negative serology samples (or tracheal swabs tested by PCR) per flock.

Backyard / hobby flocks that show birds at exhibitions or fairs in Massachusetts are tested annually; and breeder flocks (hatching eggs and breeder chicks) are tested annually. All the birds are sampled for *Salmonella pullorum* and ten percent of the samples taken are tested for avian influenza.

When a suspect positive AI flock is identified, additional cloacal (water birds) and tracheal (chickens) swab samples are taken for virus isolation. Samples are sent to the University of Connecticut Veterinary Diagnostic Laboratory, Storrs, Connecticut. Additional testing is done at USDA's National Veterinary Services Laboratory (NVSL) in Ames, Iowa. The MDAR does testing of all other birds and flocks for AI or other diseases if illness is reported.

If low pathogenic avian influenza (LPAI) were identified, MDAR would take the lead and would consult with USDA to determine a course of action. If high pathogenic avian influenza (HPAI) is identified, the USDA takes the lead role. MDAR would immediately issue a quarantine stopping movement of all birds pending further testing and would assist USDA on animal trace back, depopulation and disinfection of the premises if required. Communication with MDPH is through the State Public Health Veterinarian and epidemiologists at the MDPH Division of Epidemiology and Immunization.

5. PANDEMIC ALERT PERIOD

A. Virologic Surveillance

Increase the number of specimens submitted to SLI for testing by:

- Ask current sentinel sites to increase the number of specimens submitted to SLI.
- Increase the number of sentinel sites overall by drawing on reserve list of former sites as well as recruiting new sites.
- Increase testing and the frequency of reporting of virologic data, in order to help detect the introduction of the virus into the state.
- Additional information can be found in the laboratory surveillance section.

B. Disease Surveillance

The MDPH Influenza Surveillance team will ensure that all pre-pandemic phase surveillance activities are being carried out regardless of the time of year and that the virology isolation laboratory and sentinel sites are reporting data to CDC each week.

a. Outpatient and Hospital Surveillance

The MDPH Influenza Surveillance Team will review and implement contingency plans for enhancing influenza surveillance if efficient person-to-person transmission of the novel virus is confirmed. Such activities will attempt to contain introduction as much as possible and may include:

- Identification of cases and suspect cases meeting the latest case definition developed by CDC and WHO.
- Initiating case management and contact tracing according to the latest criteria for defining exposure to cases/suspect cases.
- Implementation of isolation for cases and quarantine (including monitoring for fever and respiratory symptoms):
    i. Home isolation/quarantine may be appropriate for a subset of these individuals.
    ii. Institutional isolation will be arranges as indicated at hospitals and other designated facilities.
    iii. Institutional quarantine may be needed in designated facilities.
- Oseltamivir will be prioritized for treatment of cases and initial contacts.
- The amantadanes will be used for prophylaxis of essential personnel.

- Will use the HHAN and other methods, such as email, text- messaging and telephone, to notify hospitals and physicians of the heightened surveillance efforts and reporting requirements, including suspect cases as well as unexplained deaths.
- Once the Health & Homeland Alert Network (HHAN) enhancement is completed, that system will be used for the reporting of this data as needed by hospitals as well as public health entities.

i. Sentinel Sites

- Immediately recruit new sites for address any areas that are under-represented (such as geographical areas or risk groups)
- Sentinel sites no longer participating that have been placed on a reserve list of sites would be activated to rapidly expand surveillance activities.
- Sentinel sites will receive updated information related to influenza surveillance, diagnosis and control as needed through an email network already established and in use.
- Will be asked to report ILI on a weekly basis throughout the year.
- Active surveillance and daily reporting by all sites to MDPH would be implemented.

ii. Reporting

- Will instruct hospital laboratories about the importance of timely electronic reporting and try to accelerate the recruitment of additional hospitals into electronic system.
- Continue to rely on electronic laboratory reporting from hospital laboratories.
- Continued use of the HHAN and listservs to inform key stakeholders of surveillance and reporting requirements.
- Expand the use of the second generation HHAN, which would include the ability to reach more stakeholders.
- Use of Hospital Diversion/Bed Reporting website for hospitals to report number of patients, etc. as described earlier to include other critical surveillance parameters.
- A guide for clinicians and laboratorians containing the latest guidance for testing and managing a suspect case of avian influenza, as well as information on reporting and infection control will be updated and widely distributed via posting on the web, the HHAN, listservs, etc..

iii. Syndromic Surveillance

- Current efforts include the evaluation of implementation of the three syndromic surveillance systems to identify outbreaks (including disease in geographic, temporal or age-specific groups) of influenza-like illness within the state.
- Activate enhanced surveillance components of these systems, which may include refining or adding additional chief complaints or ICD9 codes to the definitions, or linking the information to laboratory testing.

C. Mortality Surveillance

- Providers will be reminded about reporting requirements for unexplained or unusual deaths.
- Participation in NNDSS would continue.
- Phase 2 of ENDS would be implemented, expanding surveillance to include the 75 communities expected to yield 67% of all resident deaths.
- Surveillance for influenza deaths in Massachusetts would continue to rely on the mandatory reporting of pediatric deaths due to influenza, as well as the 122 Cities Weekly Morbidity Report, as described above under the Pre-pandemic phase. The methodology employed for this report would be expanded to include more cities and towns in Massachusetts, thus enhancing the surveillance for deaths in Massachusetts.

D. State influenza activity assessments

MDPH currently provides weekly assessments of the overall level of influenza activity (i.e., none, sporadic, local, regional, or wide-spread) in the state during influenza season using reports generated by the large interactive database mentioned above. This database could be altered as needed and the data generated can be used to determine the state influenza activity throughout the year.

a. Influenza Surveillance Coordinators

As the need for more staff increases, the number of epidemiologists working on influenza will increase to meet the need. Staff from within the Division of Epidemiology and Immunization, as well as the Bureau will assist in surveillance efforts as needed.

The influenza team will continue to monitor bulletins from CDC and other national and international sources, ensuring that all stakeholders are informed of the new guidance and developments.

b. Veterinary Surveillance

- The State Public Health Veterinarian will work in conjunction with other entities, such as the Massachusetts Department of Agricultural Resources (MDAR), U.S. Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Services (USDA/APHIA/VS) to ensure enhanced surveillance among domestic poultry and wild birds, in accordance to the current federal guidelines.
- Clusters of avian influenza in poultry will be reported via the HHAN. Further analysis will be conducted using GIS to overlay potential risk areas for human infection.

6. PANDEMIC PERIOD

The MDPH Influenza Surveillance Team will ensure that all pre-pandemic phase surveillance activities are being carried out regardless of the time of year and that the SLI viral isolation laboratory and sentinel sites are reporting data to CDC each week.

A. Virologic surveillance

During an influenza pandemic, the volume of requests for laboratory testing is expected to increase dramatically. For specifics on how the laboratories have made preparations to meet these demands, please see the laboratory section. Briefly, MDPH will increase testing and the frequency of reporting of virologic data. The most intense testing will be necessary during the early

stages of a pandemic, when detecting the introduction of the virus into a state or community is the primary goal. Once the virus has been identified throughout the state, the level of testing can be decreased to a level more like that of a non-pandemic influenza season. As part of the effort to monitor antigenic and genetic changes and changes in antiviral resistance patterns in the pandemic virus, the SLI laboratory will continue to forward a subset of virus isolates to CDC.

MDPH laboratory personnel, surveillance and information technology staff and epidemiologists meet on a monthly basis to addresses logistics of enhancing surveillance for influenza, including dealing with surge capacity, prioritization of samples, reporting of results, data collection and dissemination, and efficient and timely internal and external communication.

B. Disease Surveillance

MDPH will recommend other control measures to slow introduction according to the latest recommendations. Such activities may include social distancing activities, such as:

- Unnecessary public activities
- Decrease/suspend travel
- School closures (awaiting national guidelines on whether or not this would be an effective measure)
- Personal protective measures (respiratory hygiene, cough etiquette). (Please note, it is not known if these measures will be recommended).

Additional information can be found in the Community Disease Control and Prevention Section.

a. Outpatient and Hospital Surveillance

- Distribute to healthcare providers the current CDC recommendations for enhanced surveillance for the detection of the first cases of the pandemic virus in their jurisdictions via the HHAN.
- During a pandemic MDPH plans to conduct weekly conference calls with hospitals, professional medical groups and local health departments, and disseminate guidelines and recommendations through the HHAN, broadcast faxes to 3,000 sites, email distribution lists.
- Will continue to remind all stakeholders about timely reporting, and MDPH will conduct active surveillance for hospitalized cases or unusual presentations.

i. Sentinel Sites

- Decrease virologic surveillance to a level more like that of a non-pandemic influenza season.
- Ensure that all sentinel provider surveillance sites are reporting weekly, regardless of the time of year.

ii. Reporting

- Communicate to all partners the heightened need for timely and complete surveillance data.
- Report state influenza activity level in a timely manner.

iii. Syndromic Surveillance

- MDPH will use the syndromic surveillance systems currently in place, as well as hospital-based web reporting for monitoring trends and impact of the pandemic.

C. Mortality Surveillance

- Implement Phase 3 of ENDS. The reporting system will be deployed to all Massachusetts boards of health. MDPH BCDC will be responsible for compiling and evaluating the mortality data from ENDS. RVRS will assist BCDC, if needed, in compiling mortality data for any period prior to the deployment of ENDS and/or expediting the coding and data entry of deaths identified through ENDS for statistical evaluation.
- MDPH will facilitate timely reporting of 122 Cities Mortality Reports and pediatric deaths, and implement state and local collection of influenza-associated mortality data and reporting of statewide mortality data to CDC, following CDC guidelines for uniform data collection and reporting.

D. State Level Assessments

Weekly assessments of influenza-like illness activity level could be reported to CDC throughout the year.

E. Scaled-back Surveillance

Enhanced surveillance will be conducted during the introduction, initial spread, and first waves of a pandemic. Over time, as more persons are exposed, the pandemic strain is likely to become a routinely circulating influenza A subtype. When that happens, the activities of the national influenza surveillance system will revert to the frequency and intensity typically seen during interpandemic influenza seasons. Massachusetts will follow the national guidelines and communicate this to all surveillance partners.

TABLE 1. COMPONENTS OF THE MASSACHUSETTS INFLUENZA SURVEILLANCE SYSTEM

Activity	Surveillance	Description
The SLI is a participating member of the U.S. collaborating laboratories of the: • WHO Global Influenza Surveillance Network • National Respiratory and Enteric Virus Surveillance System (NREVSS)	Virologic surveillance	The SLI laboratory reports weekly to CDC the number of influenza tests performed and the number of positive results by type, and in some cases, subtype and age group. If non-subtypable viruses or unusual subtypes are detected, the specimens are sent to the CDC for further testing.
Sentinel Provider Network (SPN)	Outpatient surveillance	Approximately 40 healthcare providers from around the state monitor outpatient visits for ILI (fever >100°F or 37.8°C AND sore throat and/or cough in the absence of a known cause other than influenza). Specimens from a small subset of patients are submitted to state public health laboratories for influenza virus testing.
122 Cities Mortality Reporting System	Mortality surveillance	Nine cites and towns in Massachusetts records offices transmit weekly data to CDC on the total number of death certificates filed and the number with pneumonia and/or influenza listed as a cause of death.
National Notifiable Disease Surveillance System (NNDSS) influenza-associated pediatric mortality	Mortality surveillance	MDPH reports to CDC all laboratory-confirmed influenza-related deaths among children <18 years.
State and territorial epidemiologists' reports	State-level assessments	MDPH reports on a weekly basis the overall level of influenza activity as none, sporadic, local, regional, or widespread.
Children's Hospital (AEGIS) system	Syndromic Surveillance	Alert MDPH when the number of cases fitting the syndrome exceed spatial or temporal thresholds, and allows for investigation of cluster.
HPHC/HVMA System	Syndromic Surveillance	Alerts MDPH when the number of cases fitting the syndrome exceeds spatial or temporal thresholds, and allows for investigation of cluster.
City of Boston EARS data	Syndromic Surveillance	Boston Emergency Rooms' chief complaint data

APPENDIX 1. TYPES OF INFLUENZA SURVEILLANCE

A. Virologic surveillance

- A network of ~75 WHO collaborating laboratories and ~90 NREVSS collaborating laboratories report the total number of respiratory specimens tested and the number positive for influenza by type, subtype, and age group to CDC each week. (Because ~40 of the NREVSS laboratories are also WHO laboratories, the total number in the WHO/NREVSS network is ~125.) Data from the two networks are combined and analyzed together.
- WHO collaborating laboratory network:
    - All 50 state health department laboratories, 4 large county public health laboratories, a DOD reference laboratory, and ~25 tertiary-care hospital and academic center laboratories participate.
    - State and county public health laboratories subtype (i.e., A/H1 vs. A/H3) ~80% of their influenza A isolates.
    - Laboratories report the number of tests performed and results by age group to CDC's Influenza Branch.
    - Approximately 30% of laboratories report specimen-level data electronically using PHLIS, ~40% report aggregate weekly data via the Internet and ~ 30% report aggregate weekly data via fax.
    -
- NREVSS collaborating laboratory network:
    - Primarily hospital laboratories
    - Most do not subtype influenza viruses, and none report age-group data
- Laboratories report aggregate weekly numbers of tests performed and results to CDC's Respiratory and Enteric Viruses Branch (REVB) by phone or Internet.
- Laboratories test for influenza viruses by viral culture, PCR, or antigen detection.
- Most laboratories maintain the ability to test for influenza year-round.
- Data are available to state health department influenza surveillance coordinators on a password-protected website that is updated once a week during October through May and periodically throughout the summer. National and regional data are made available to all states, and state-specific data (including a laboratory-specific line list) are available to the states from which the data were reported.

B. Outpatient ILI surveillance (Sentinel Provider Network)

- Network of ~40 health care providers across the state record the number of outpatients seen for any reason and the number with ILI by age group and report directly to CDC each week.
- ILI is defined as fever (>100°F or 37.8°C) AND sore throat and/or cough in the absence of a known cause other than influenza.
- All providers in Massachusetts are requested to report year-round.
- The network is a collaborative effort between CDC and state health departments.
- The MDPH Influenza Surveillance Team recruits and maintains the network of providers in the Commonwealth and tests, free of charge, a subset of specimens from providers.
- CDC develops and maintains reporting materials and systems, serves as a data repository, and provides data feedback to the states.
- Providers collect two or three specimens from patients with ILI at the beginning, middle, and end of the season and from any unusual clinical cases, severe cases, outbreak-related cases, and patients with ILI during the summer.
- Providers report to CDC via a password-protected Internet site (75%), faxes (13%), or phone (12%).

- Data are available to the MDPH Influenza Surveillance team on a password-protected website.
- Data reported by providers on the Internet are available in real time, and data reported to CDC by fax are updated once each weekday. Regional data are available to all states, whereas state-specific data are available to the states from which the data were reported.

C. Hospitalization surveillance

Hospital surveillance in Massachusetts includes the following:

Syndromic Surveillance:

- **City of Boston EARS emergency room data**: Existing emergency department "chief complaint" monitoring system is used by 11 hospitals in the city of Boston and the data is reported to and compiled by the Boston Public Health Commission on a daily basis. Such information includes: age, gender, race/ethnicity, zip code of primary residence, the chief complaint, ICD-9 code when available, and a unique patient identifier (HIPAA-compliant).
- **Harvard Pilgrim Health Care/Vanguard Medical Associates (HPHC/HVMA)** syndromic surveillance: HPHC is a large managed care organization in eastern MA that collects timely data on all of its members via comprehensive electronic medical records. The file contains >465,000members who receive care at 14 HVMA sites, and all individuals' addresses were geocoded when possible. A system has been developed by which temporal and geographic clusters of cases with diagnoses suggesting respiratory tract illness or influenza-like illness (ILI) can be identified and reported to MDPH via automated alerts the day after the patients' medical encounters. In addition, this system has a website on which raw counts of respiratory and ILI by date and zip code of residence can be monitored by MDPH staff. An epidemiologist promptly investigates significant events.
- **Children's Hospital Boston (CHB),** has developed a system based on emergency department (ED) chief complaints, which are available on-line within minutes of a patient's arrival in the ED. The system will detect surges in patients presenting with respiratory syndromes to EDs, relying on patterns in time (day and season of visit) and in space (home address). In addition to CHB, agreements are currently in place with 8 other hospitals in Massachusetts to assess their data systems for potential inclusion in this syndromic surveillance system.

Hospitalization reported on Rapid Diagnostic Test Reports

The current reporting form for providers, laboratories and hospitals to report positive rapid diagnostic tests for influenza include a question about hospitalization, and the data can be queried as needed to determine the number of hospitalizations due to influenza.

D. Mortality surveillance

- Vital statistics offices in 122 cities covering between one-fourth and one-third of the U.S. population report weekly throughout the year the total number of death certificates filed and the number with pneumonia and/or influenza listed anywhere on the death certificate, by age group. No additional information (e.g., underlying medical condition, demographics) is available. On average, there is a 15-day lag from death to report to CDC.
- Weekly mortality data from the 122 cities are compared to a seasonal baseline calculated using a robust regression procedure run on the previous 5 years of data. If the proportion of P&I deaths for a given week exceeds the baseline value for that week by a statistically significant amount, P&I deaths are said to be above the epidemic threshold, and the proportion of deaths above threshold are considered attributable to influenza.

- Data from all 122 cities are combined, and the percentage of all P&I deaths are calculated and compared to the expected percentage for that week.
- Data can be analyzed by age group and geographic region, but interpretation of the data requires the development of a separate baseline for each data subset. It is not valid to compare data from a particular city or region to the national baseline.
- Detailed data (e.g., person-level data including multiple causes of death, underlying medical conditions, demographics) on ~99% of deaths in the United States are available from NCHS, but these data have a time lag of ~2-3 years.
- Pediatric deaths associated with laboratory-confirmed influenza were made nationally notifiable in October 2004.
- Since the 2004-2005 season, the condition was reportable in Massachusetts. CDC receives electronic, patient-level data on these deaths.

E. State-level influenza activity assessments

MDPH reports a weekly assessment of the overall level of influenza activity (none, sporadic, local, regional, or widespread) in the state (see box below). These assessments are used to compare the extent of influenza activity from state to state and represent the only state-level influenza surveillance data that CDC makes publicly available during the interpandemic influenza season.